Delivery of GCSE in Year 9:

This qualification is linear, with all of the assessments of the program of study occurring at the end of Year 11 during the summer exam season. Students will start this qualification in December of Year 9 following the completion of the KS3 Program of study. This is to allow the full breadth and depth of the KS4 course to be delivered allowing us to stretch and challenge the most-able to master the course and achieve the top grades, and also allow time for support and differentiation where required. The topics studied during Year 9 appear on both the Trilogy specification and the Separate Science specification to allow for co-teaching. Following the options process started in Year 9, student will then move onto their specific chosen science course as they enter Year 10.

During Year 9 students will be taught 3 lessons of Science per week: one for Biology, Chemistry and Physics. In Year 10, students have 5 hours of Science curriculum - we follow a rotation timetable system to allow an even spread of time for the 3 sciences. In Year 11, students have 7 hours of science curriculum time spread across the 3 subjects.

The aim of the GCSE Biology course is:

- Impart a systematic body of scientific knowledge and facts, and an understanding of scientific concepts, principles, themes and patterns across Biology.
- Further students' appreciation of the practical nature of science, developing experimental skills based on correct and safe laboratory techniques, developing analytical and evaluative skills to determine clear conclusions.
- Develop application skills to allow students to think outside the box with unfamiliar examples, applying their knowledge and understanding of key science processes.
- Develop an appreciation of the importance of accurate experimental work to scientific method and reporting, ensuring complicated methods are followed and measurements recorded to a high level of precision.
- Develop the application of science specific mathematics skills.
- Develop students' ability to form hypotheses and design experiments to test them, writing clear methods identifying specific apparatus and techniques required.
- Sustain and develop an enjoyment of and interest in the scientific world of Biology, identifying overlaps with Chemistry and Physics.
- Foster an appreciation of the significance of science in wider personal, social, environmental, economic and technological contexts, with a consideration of ethical issues.
- Develop future Scientists who will continue the study of Sciences onto A level and Higher Education.

Key ideas in Biology:

The complex and diverse phenomena of the natural world can be described in terms of a small number of key ideas in biology.
These key ideas are of universal application, and we have embedded them throughout the subject content. They underpin many aspects of the science assessment.

These ideas include:
• life processes depend on molecules whose structure is related to their function
• the fundamental units of living organisms are cells, which may be part of highly adapted structures including tissues, organs and organ systems, enabling living processes to be performed effectively
• living organisms may form populations of single species, communities of many species and ecosystems, interacting with each other, with the environment and with humans in many different ways
• living organisms are interdependent and show adaptations to their environment
• life on Earth is dependent on photosynthesis in which green plants and algae trap light from the Sun to fix carbon dioxide and combine it with hydrogen from water to make organic compounds and oxygen
• organic compounds are used as fuels in cellular respiration to allow the other chemical reactions necessary for life
• the chemicals in ecosystems are continually cycling through the natural world
• the characteristics of a living organism are influenced by its genome and its interaction with the environment
• evolution occurs by a process of natural selection and accounts both for biodiversity and how organisms are all related to varying degrees

Prior learning:

Science is a core subject that students have studied at KS3, the aim of KS4 Science is to build on these foundations as part of our spiral curriculum, increasing the level of demand and challenge as students' cognitive ability develops. The rationale behind the teaching order is to ensure the building blocks are in place as we progress through the topics, allowing students to fully access each topic. Seasonal considerations are taken into account such as teaching the Ecology topic during the summer months to allow for practical activities to take place outside of the classroom when the weather is less unpredictable.

GCSE Biology students have one teacher for Year 10 and one teacher for Year 11. This is to ensure as much consistency as possible for students. In Year 9 and 10, students learn the fundamental concepts of Biology which are then revisited in the spiral curriculum to learn in more depth later on in the course. Students build on this foundation of knowledge as they learn more challenging concepts. For example, the basic process of osmosis is taught early in the course and must be fully understood before learning about kidney function and water regulation in the body.

Biology Delivery

Year	Topic	Term		Content	Paper number
4.1 Cell Biology					
9	4.1.1 Cell structure	Autumn/ Spring		4.1.1.1 Eukaryotes and prokaryotes 4.1.1.2 Animal and plant cells 4.1.1.3 Cell specialisation 4.1.1.4 Cell differentiation 4.1.1.5 Microscopy Builds on key cells concepts from Y7, uses a greater level of specialist terms and introduces more organelle. Practical skills development from just using a microscope to drawing + labelling skills, and using a eye piece graticule to draw to scale.	1
9	4.1.2 Cell division	Spring		4.1.2.1 Chromosomes 4.1.2.2 Mitosis and the cell cycle 4.1.2.3 Stem cells Building on cell structure, introducing where and how DNA is located and stored.	1
9	4.1.3 Transport in cells	Spring		4.1.3.1 Diffusion 4.1.3.2 Osmosis 4.1.3.3 Active transport Importance of the cell membrane is now explored in the context of transport in and out of cells – must be covered AFTER cell structure.	1
4.2 Organisation					
9/10	4.2.1 Principles of organisation	Summer		Cells are the basic building blocks of all living organisms. A tissue is a group of cells with a similar structure and function. Organs are aggregations of tissues performing specific functions. Organs are organised into organ systems, which work together to form organisms How cells are arranged in terms of organisation for large multicellular organisms. Students must know the structure of a cell before applying this to the formation of tissue, organs and organ systems.	1
9/10	4.2.2 Animal tissues, organs and organ systems	Autumn		4.2.2.1 The human digestive system 4.2.2.2 The heart and blood vessels 4.2.2.3 Blood 4.2.2.4 Coronary heart disease: a non-communicable disease 4.2.2.5 Health issues 4.2.2.6 The effect of lifestyle on some non-communicable diseases 4.2.2.7 Cancer	1

				Builds on KS3 prior learning, identifying specific structures in the heart and digestive system. Opportunities for dissection and practical skills rather than just a demonstration. 4.2.2.4 Coronary heart disease: a non-communicable disease 4.2.2.5 Health issues – Builds significantly further on the health and diet topics at KS3 These topics covered in this order linking the heart structure to problems that can occur. The non-communicable disease discussions and cancer are first introduced here to be discussed later in the next topic. 4.2.2.6 The effect of lifestyle on some non-communicable diseases 4.2.2.7 Cancer First discussed in the Cell Biology topic. Students understand what cancer is and build on that by looking at risk factors associated with cancer.	
10	4.2.3.1 Plant tissues, organs and systems	Autumn		4.2.3.1 Plant tissues – Students already understand what a tissue is in animals, so can apply this knowledge to the plant topic. 4.2.3.2 Plant organ system Students are familiar with animal organs, so this is studied first to learn the key terminology, then the plant topic is studied with a more familiar context.	1
4.3 Infection and response					
10	4.3.1 Communicable diseases	Autumn / Spring		4.3.1.1 Communicable (infectious) diseases 4.3.1.2 Viral diseases 4.3.1.3 Bacterial diseases 4.3.1.4 Fungal diseases 4.3.1.5 Protist diseases 4.3.1.6 Human defence systems 4.3.1.7 Vaccination 4.3.1.8 Antibiotics and painkillers 4.3.1.9 Discovery and development of drugs Taught after the cells topic, so student have a firm understanding of microorganisms and the relative units used in measurements. The cells topic also introduces white blood cells in the cell specialisation topic so have a basic understanding of the structure and adaptation of cells in immunology.	1

10	4.3.2 Monoclonal antibodies (HT only)	Spring		4.3.2.1 Producing monoclonal antibodies 4.3.2.2 Uses of monoclonal antibodies This topic is building on students' knowledge of cancer cells, studied in 4.1 Cell Biology.	
10	4.3.3 Plant disease	Spring		4.3.3.1 Detection and identification of plant diseases 4.3.3.2. Plant defence responses Students are familiar with animal immunology, so this is studied first to learn the key terminology, then the plant disease topic is studied with a more familiar context.	
4.4 Bioenergetics					
10	4.4.1 Photosynthesis	Spring/ Summer		4.4.1.1 Photosynthetic reaction 4.4.1.2 Rate of photosynthesis 4.4.1.3 Uses of glucose from photosynthesis Requires understanding of balancing equations, so taught later in Y10. Biochemistry is more challenging, also for practical investigations is studied in the summer when plenty of pond weed is available.	1
10	4.4.2 Respiration	Summer		4.4.2.1 Aerobic and anaerobic respiration 4.4.2.2 Response to exercise 4.4.2.3 Metabolism Taught with Photosynthesis in Bioenergetics topic, last topic in Biology paper 1. Students should already have a basic understanding of respiration from KS3. By this point in the topic, students have an understanding of what glucose is and what it is used for by the body.	1
4.5 Homeostasis and response					
10/11	4.5.1 Homeostasis	Yr10- Summer Yr11- Autumn		Students should be able to explain that homeostasis is the regulation of the internal conditions of a cell or organism to maintain optimum conditions for function in response to internal and external changes. Fundamentals discussed in terms of the principle of homeostasis and negative feedback. Need for receptors, coordinators and effectors	2
11	4.5.2 The human nervous system	Autumn		4.5.2.1 Structure and function of the nervous system 4.5.2.2 The brain 4.5.2.3 The eye 4.5.2.4 Control of body temperature	2

				Students should be able to explain how the structure of the nervous system is adapted to its functions. Students understand the structure and function of the nervous system from the Cells specialisation lesson. As well as adaptations on a cellular level of other cell types. Comparisons with methods of communication – hormonal	
11	4.5.3 Hormonal coordination in humans	Autumn		4.5.3.1 Human endocrine system 4.5.3.2 Control of blood glucose concentration 4.5.3.3 Maintaining water and nitrogen balance in the body 4.5.3.4 Hormones in human reproduction 4.5.3.5 Contraception 4.5.3.6 The use of hormones to treat infertility (HT only) 4.5.3.7 Negative feedback (HT only) Comparisons with methods of communication – neuronal. Links for specific examples of homeostasis	2
11	4.5.4 Plant hormones	Autumn		4.5.4.1 Control and coordination 4.5.4.2 Use of plant hormones (HT only) Students are familiar with animal hormones, so this is studied first to learn the key terminology, then the plant topic is studied with a more familiar context.	
4.6 Inheritance, variation and evolution					
11	4.6.1 Reproduction	Autumn/ Spring		4.6.1.1 Sexual and asexual reproduction 4.6.1.2 Meiosis 4.6.1.3 Advantages and disadvantages of sexual and asexual reproduction 4.6.1.4 DNA and the genome 4.6.1.5 DNA structure 4.6.1.6 Genetic inheritance 4.6.1.7 Inherited disorders 4.6.1.8 Sex determination Building on the DNA and chromosomes work from Y10 and KS3, different types of reproduction and the formation of individual cells.	2
11	4.6.2 Variation and evolution	Spring		4.6.2.1 Variation 4.6.2.2 Evolution 4.6.2.3 Selective breeding 4.6.2.4 Genetic engineering 4.6.2.5 Cloning Taught after Meiosis and sexual reproduction to give reasoning for variation. Very conceptual topic.	2

				Before students learn about variation and evolution, it is vital they understand what makes a gene and why characteristics are expressed in the phenotype. All of this is taught in the previous topic 4.6.1. For the genetic engineering topic, students have developed an understanding of the structure of bacteria (e.g. plasmids). Students need to have a good understanding of the structure of bacteria before learning about genetic engineering. This is covered in Cell Biology and Communicable diseases in Y10.	
11	4.6.3 The development of understanding of genetics and evolution	Spring		4.6.3.1 Theory of evolution 4.6.3.2 Speciation 4.6.3.3 The understanding of genetics 4.6.3.4 Evidence for evolution 4.6.3.5 Fossils 4.6.3.6 Extinction 4.6.3.7 Resistant bacteria Follows on from variation to evolution – processes discussed and developed.	2
11	4.6.4 Classification of living organisms	Spring		4.6.4 Classification of living organisms Traditionally living things have been classified into groups depending on their structure and characteristics in a system developed by Carl Linnaeus. Linnaeus classified living things into kingdom, phylum, class, order, family, genus and species. Organisms are named by the binomial system of genus and species. Students should be able to use information given to show understanding of the Linnaean system. Very conceptual topic, builds on the large range of living organisms discussed in previous topics.	2
4.7 Ecology					
11	4.7.1 Adaptations, interdependence and competition	Spring		4.7.1.1 Communities 4.7.1.2 Abiotic factors 4.7.1.3 Biotic factors 4.7.1.4 Adaptations In year 11 as its paper, 2, but delivered as close to the summer as possible to allow for practical activities and sampling	2
11	4.7.2 Organisation of an ecosystem	Spring		4.7.2.1 Levels of organisation 4.7.2.2 How materials are cycled 4.7.2.3 Decomposition 4.7.2.4 Impact of environmental change	2

				Conceptual development of the topic and need for cycling of nutrients, links to abiotic factors previously discussed	
11	4.7.3 Biodiversity and the effect of human interaction on ecosystems	Spring		4.7.3.1 Biodiversity 4.7.3.2 Waste management 4.7.3.3 Land use 4.7.3.4 Deforestation 4.7.3.5 Global warming 4.7.3.6 Maintaining biodiversity Identifies Human impacts on ecosystems, allows for widest thinking about consequences to ecosystems.	2
11	4.7.4 Trophic levels in an ecosystem	Spring		4.7.4.1 Trophic levels 4.7.4.2 Pyramids of biomass 4.7.4.3 Transfer of biomass Students have the prior learning of respiration and therefore can apply this to how energy is used and how it could be dissipated within energy transfers in trophic levels.	
11	4.7.5.1 Food production	Spring		4.7.5.1 Factors affecting food security 4.7.5.2 Farming techniques 4.7.5.3 Sustainable fisheries 4.7.5.4 Role of biotechnology These topics are taught by at the end of the course as students not only need to apply their knowledge of food chains and energy transfer but have a wider understanding of the context of these topics as real-world applications. Students need to have the skill to link the deeper understanding of the consequences certain actions can have on an ecosystem.	

Assessments:

Assessment at end of topics – At the end of each major topic, there is an end of topic assessment, this has been created using EXAMPRO (AQA exam question database), with assessments being created in line with the AQA Science papers, for the correct balance of high, medium and low demand questions for Higher / Foundation tiers. For larger topics, students have a mid-topic assessment to review progress midway through the topic and identify any areas for development before the final assessment for that topic.

Final external assessment breakdown table

2.2 Assessments

Paper 1	Paper 2
What's assessed Topics 1–4: Cell biology; Organisation; Infection and response; and Bioenergetics.	**What's assessed** Topics 5–7: Homeostasis and response; Inheritance, variation and evolution; and Ecology.
How it's assessed • Written exam: 1 hour 45 minutes • Foundation and Higher Tier • 100 marks • 50% of GCSE	**How it's assessed** • Written exam: 1 hour 45 minutes • Foundation and Higher Tier • 100 marks • 50% of GCSE
Questions Multiple choice, structured, closed short answer and open response.	**Questions** Multiple choice, structured, closed short answer and open response.

5.2.1 Assessment objective weightings for GCSE Biology

Assessment objectives (AOs)	Component weightings (approx %)		Overall weighting (approx %)
	Paper 1	Paper 2	
AO1	37–43	37–43	40
AO2	37–43	37–43	40
AO3	17–23	17–23	20
Overall weighting of components	50	50	100

5.3 Assessment weightings

The marks awarded on the papers will be scaled to meet the weighting of the components. Students' final marks will be calculated by adding together the scaled marks for each component. Grade boundaries will be set using this total scaled mark. The scaling and total scaled marks are shown in the table below.

Component	Maximum raw mark	Scaling factor	Maximum scaled mark
Paper 1	100	x1	100
Paper 2	100	x1	100
Total scaled mark:			200

Further curriculum support:

- www.kerboodle.com – online textbook
- Seneca learning
- BBC Bitesize – GCSE Biology - GCSE Biology (Single Science) - AQA - BBC Bitesize
- GCSEPod
- CGP Complete revision and Practice Book

- CGP Required Practical exam skills book – 10 minute tests

Enrichment activities

- GCSE Science Live event in Birmingham / Sheffield (Year 10)

Progression – where can subject take you:

GCSE Biology provides an excellent platform to the progression onto KS5 A levels in Biology and Psychology.